

# Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

Test equipment Solutions Ltd  
Unit 8 Elder Way  
Waterside Drive  
Langley  
Berkshire  
SL3 6EP

T: +44 (0)1753 596000  
F: +44 (0)1753 596001

Email: [info@TestEquipmentHQ.com](mailto:info@TestEquipmentHQ.com)  
Web: [www.TestEquipmentHQ.com](http://www.TestEquipmentHQ.com)



# Spectrum Master™

## Compact Handheld Spectrum Analyzer

**MS2712E**  
100 kHz to 4 GHz

**MS2713E**  
100 kHz to 6 GHz

### Introduction

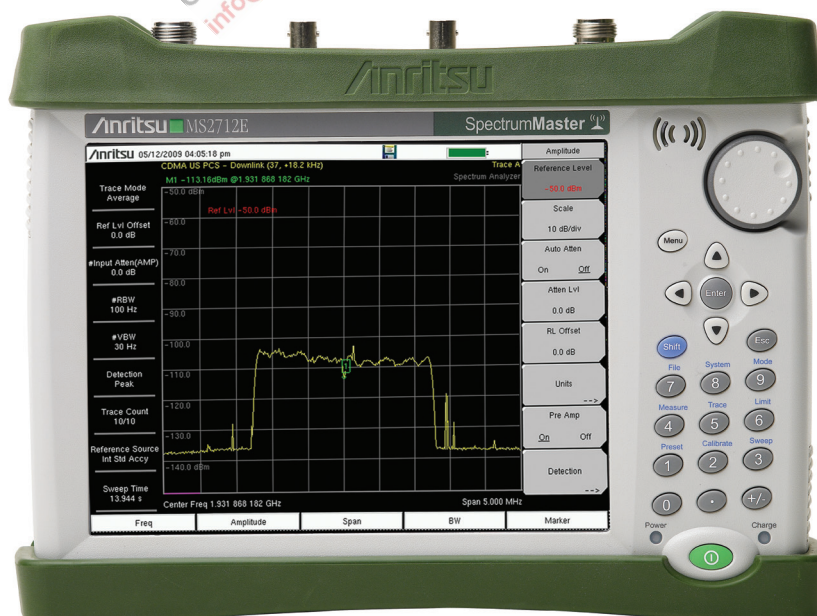
Anritsu introduces its next generation compact handheld Spectrum Analyzers to meet the needs for portability. Whether it is for spectrum monitoring, broadcast proofing, interference analysis, RF and microwave measurements, or Wi-Fi and wireless network measurements, the Spectrum Master is the ideal instrument for making fast and reliable measurements.

### Spectrum Analyzer Highlights

- Measurements: Occupied Bandwidth, Channel Power, ACPR, C/I
- Interference Analyzer: Spectrogram, Signal Strength, RSSI, Mapping
- Dynamic Range: > 102 dB in 1 Hz RBW
- DANL: -162 dBm in 1 Hz RBW
- Phase Noise: -100 dBc/Hz max @ 10 kHz offset at 1 GHz
- Frequency Accuracy: < ± 50 ppb with GPS On
- 2-port Transmission Measurements: High/Low Power
- Traces: Normal, Max Hold, Min Hold, Average, # of Averages
- Detectors: Peak, Negative, Sample, Quasi-peak, and true RMS
- Markers: 6, each with a Delta Marker, or 1 Reference with 6 Deltas
- Limit Lines: up to 41 segments with one-button envelope creation
- Trace Save-on-Event: crossing limit line or sweep complete

### Capabilities and Functional Highlights

- LTE, CDMA, EV-DO
- GSM/EDGE
- W-CDMA/HSPA+
- TD-SCDMA/HSPA+
- Fixed, Mobile WiMAX
- ISDB-T, ISDB-T SFN
- DVB-T/H, DVB-T/H SFN
- P25 and NXDN
- PIM Analyzer
- Gated Sweep
- CW Signal Generator
- Internal Preamplifier standard
- Internal Bias-Tee
- Internal Power Meter
- High Accuracy Power Meter
- 4, 6, 8, 18, 26 GHz Power Sensors
- GPS tagging of saved traces
- Channel Scanner
- < 5 minute warm-up time
- 3 hour battery operation time
- New Fast Sweep Speed Mode
- On-Screen Coverage Mapping
- Touchscreen keyboard
- USB & Optional Ethernet (Option 0411) for data transfer and instrument control
- Increase throughput by automating repetitive or operator intensive tasks via Ethernet or USB. Remote programming provided via Ethernet (Option 0411).
- Master Software Tools
- Line Sweep Tools



*Spectrum Master™ MS2712E Spectrum Analyzer featuring 8.4" Daylight Viewable Touchscreen  
Compact Size: 273 mm x 199 mm x 91 mm, (10.7 in x 7.8 in x 3.6 in), Lightweight: 3.45 kg, (7.6 lbs)*

# Spectrum Master™ MS2712E and MS2713E Specifications



## Spectrum Analyzer

### Measurements

Smart Measurements	Field Strength (uses antenna calibration tables to measure dBm/m <sup>2</sup> or dBmV/m) Occupied Bandwidth (measures 99% to 1% power channel of a signal) Channel Power (measures the total power in a specified bandwidth) ACPR (adjacent channel power ratio) AM/FM/SSB Demodulation (wide/narrow FM, USB and LSB), (audio out only) C/I (carrier-to-interference ratio) Emission Mask Coverage Mapping (requires Option 0431)
--------------------	--

### Setup Parameters

Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #, Channel Increment
Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
Bandwidth	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW, Span/RBW
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Limit Lines, Screen Shots Jpeg (save only), Save-on-Event
Save-on-Event	Crossing Limit Line, Sweep Complete, Save-then-Stop, Clear All
Delete	Selected File, All Measurements, All Mode Files, All Content
Directory Management	Sort Method (Name/Type/Date), Ascend/Descend, Internal/USB, Copy, Format USB
Application Options	Bias-Tee (On/Off), Impedance (50 $\Omega$ , 75 $\Omega$ , Other)

### Sweep Functions

Sweep	Single/Continuous, Sweep Mode (Fast, Performance, No FFT), Reset, Detection, Minimum Sweep Time, Trigger Type, Gated Sweep (see Option 0090)
Detection	Peak, RMS, Negative, Sample, Quasi-peak
Triggers	Free Run, External, Video, Change Position, Manual

### Trace Functions

Traces	Up to three Traces (A, B, C), View/Blank, Write/Hold, Trace A/B/C Operations
Trace A Operations	Normal, Max Hold, Min Hold, Average, # of Averages, (always the live trace)
Trace B Operations	A $\rightarrow$ B, B $\leftrightarrow$ C, Max Hold, Min Hold
Trace C Operations	A $\rightarrow$ C, B $\leftrightarrow$ C, Max Hold, Min Hold, A - B $\rightarrow$ C, B - A $\rightarrow$ C, Relative Reference (dB), Scale

### Marker Functions

Markers	Markers 1-6 each with a Delta Marker, or Marker 1 Reference with Six Delta Markers, Marker Table (On/Off), All Markers Off,
Marker Types	Style (Fixed/Tracking), Noise Marker, Frequency Counter Marker
Marker Auto-Position	Peak Search, Next Peak (Right/Left), Peak Threshold %, Set Marker to Channel, Marker Frequency to Center, Delta Marker to Span, Marker to Reference Level
Marker Table	1-6 markers frequency and amplitude plus delta markers frequency amplitude and offset

### Limit Line Functions

Limit Lines	Upper/Lower, On/Off, Edit, Move, Envelope, Advanced, Limit Alarm, Default Limit
Limit Line Edit	Frequency, Amplitude, Add Point, Add Vertical, Delete Point, Next Point Left/Right
Limit Line Move	To Current Center Frequency, By dB or Hz, To Marker 1, Offset from Marker 1
Limit Line Envelope	Create Envelope, Update Amplitude, Points (41 max), Offset, Shape Square/Slope
Limit Line Advanced	Type (Absolute/Relative), Mirror, Save/Recall

### Frequency

Frequency Range	100 kHz to 4 GHz (MS2712E), 100 kHz to 6 GHz (MS2713E) (usable to 0 Hz)
Tuning Resolution	1 Hz
Frequency Reference	Aging: $\pm 1.0$ ppm/year Accuracy: $\pm 1.5$ ppm (25 $^{\circ}$ C $\pm 25$ $^{\circ}$ C) + aging, $< \pm 50$ ppb with GPS On
Frequency Span	10 Hz to 4 GHz including zero span (MS2712E), 10 Hz to 6 GHz including zero span (MS2713E)
Sweep Time	Minimum 100 ms, 10 $\mu$ s to 600 seconds in zero span
Sweep Time Accuracy	$\pm 2$ % in zero span

### Bandwidth

Resolution Bandwidth (RBW)	1 Hz to 3 MHz in 1-3 sequence $\pm 10\%$ (1 MHz max in zero-span) (-3 dB bandwidth)
Video Bandwidth (VBW)	1 Hz to 3 MHz in 1-3 sequence (-3 dB bandwidth) (auto or manually selectable)
RBW with Quasi-Peak Detection	200 Hz, 9 KHz, 120 kHz (-6 dB bandwidth)
VBW with Quasi-Peak Detection	Auto VBW is On, RBW/VBW = 1

# Spectrum Master™ MS2712E and MS2713E Specifications



## Spectrum Analyzer (continued)

### Spectral Purity

SSB Phase Noise @ 1 GHz	-100 dBc/Hz, -110 dBc/Hz typical @ 10 kHz offset
	-105 dBc/Hz, -112 dBc/Hz typical @ 100 kHz offset
	-115 dBc/Hz, -121 dBc/Hz typical @ 1 MHz offset

### Amplitude Ranges

Dynamic Range	> 102 dB (2.4 GHz), 2/3 (TOI-DANL) in 1 Hz RBW
Measurement Range	DANL to +26 dBm
Display Range	1 dB to 15 dB/div in 1 dB steps, ten divisions displayed
Reference Level Range	-120 dBm to +30 dBm
Attenuator Range	0 dB to 55 dB in 5 dB steps
Maximum Continuous Input	+30 dBm
Amplitude Units	Log Scale Modes: dBm, dBV, dBmV, dBμV Linear Scale Modes: nV, μV, mV, V, kV, nW, μW, mW, W, kW

### Amplitude Accuracy

100 kHz to 4.0 GHz	± 1.25 dB, ± 0.5 dB typical
> 4.0 GHz to 6 GHz	± 1.50 dB, ± 0.5 dB typical

### Displayed Average Noise Level (DANL)

(RBW = 1 Hz, 0 dB attenuation)	Preamp Off (Reference level -20 dBm)		Preamp On (Reference level -50 dBm)	
	Maximum	Typical	Maximum	Typical
10 MHz to 2.4 GHz	-141 dBm	-146 dBm	-157 dBm	-162 dBm
>2.4 GHz to 4 GHz	-137 dBm	-141 dBm	-154 dBm	-159 dBm
>4 GHz to 5 GHz	-134 dBm	-138 dBm	-150 dBm	-155 dBm
> 5 GHz to 6 GHz	-126 dBm	-131 dBm	-143 dBm	-150 dBm

### Spurs

Residual Spurious	< -90 dBm (RF input terminated, 0 dB input attenuation, > 10 MHz)
Input-Related Spurious	< -75 dBc (0 dB attenuation, -30 dBm input, span < 1.7 GHz, carrier offset > 4.5 MHz)
Exceptions, typical	< -70 dBc @ <2.5 GHz, with 2072.5 MHz Input < -68 dBc @ F1 - 280 MHz with F1 Input < -70 dBc @ F1 + 190.5 MHz with F1 Input < -52 dBc @ 7349 - (2F2) MHz, with F2 Input, where F2 < 2424.5 MHz < -55 dBc @ 190.5 ± (F1/2) MHz, F1 < 1 GHz

### Third-Order Intercept (TOI)

	Preamp Off (-20 dBm tones 100 kHz apart, 10 dB attenuation)
800 MHz	+16 dBm
2400 MHz	+20 dBm
200-2200 MHz	+25 dBm, typical
> 2.2 GHz to 5.0 GHz	+28 dBm, typical
> 5.0 GHz to 6.0 GHz	+33 dBm, typical

### Second Harmonic Distortion

	Preamp Off, 0 dB input attenuation, -30 dBm input
50 MHz	-56 dBc
> 50 MHz to 200 MHz	-60 dBc, typical
> 200 MHz to 3000 MHz	-70 dBc, typical

### VSWR

2:1, typical



# Spectrum Master™ MS2712E and MS2713E Specifications



## PIM Analyzer (Requires PIM Master™)

See Product Brochure 11410-00546



## 2-Port Transmission Measurement (Option 0021)

### Frequency

Frequency Range	2 MHz to 4 GHz (MS2712E), 2 MHz to 6 GHz (MS2713E)
Frequency Resolution	10 Hz

### Output Power

High	0 dBm, typical
Low	-30 dBm, typical

### Dynamic Range

2 MHz to 4 GHz	80 dB
>4 GHz to 6 GHz	70 dB

Application Options	Bias-Tee (On/Off), Impedance (50 $\Omega$ , 75 $\Omega$ , Other)
---------------------	--

## Bias-Tee (Option 0010)

Setup	On/Off, Voltage, Current (Low/High)
Voltage Range	+12 V to +32 V
Current (Low/High)	250 mA/450 mA, 1 A surge for 100 ms
Resolution	0.1 V



## Coverage Mapping (Options 0431)

### Measurements

#### Indoor Mapping

RSSI
ACPR

#### Outdoor Mapping

RSSI
ACPR

### Setup Parameters

Frequency	Center/Start/Stop, Span, Freq Step, Signal Standard, Channel #, Channel Increment
Amplitude	Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection
Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
BW	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW, Span/VBW
Measurement Setup	ACPR, RSSI
Point Distance / Time Setup	Repeat Type Time Distance
Save Points Map	Save KML, JPEG, Tab Delimited
Recall Points Map	Recall Map, Recall KML Points only, Recall KML Points with Map, Recall Default Grid

## Ethernet Connectivity (Option 0411)

Connector	RJ45
LAN Speed	10 Mbps
Mode	Static, DHCP
Static IP settings	IP address Subnet Mask IP Gateway
Remote Control	Remote Access utility provided with Master Software Tools
Data Upload	With Line Sweep Tools through LAN connection

# Spectrum Master™ MS2712E and MS2713E Specifications



## Interference Analyzer (Option 0025)

Measurements	Spectrum Field Strength Occupied Bandwidth Channel Power Adjacent Channel Power (ACPR) AM/FM/SSB Demodulation (Wide/Narrow FM, Upper/Lower SSB), (audio out only) Carrier-to-Interference ratio (C/I) Spectrogram (Collect data up to one week) Signal Strength (Gives visual and aural indication of signal strength) Received Signal Strength Indicator (RSSI) (collect data up to one week) Gives visual and aural indication of signal strength Signal ID (up to 12 signals) Center Frequency Bandwidth Signal Type (FM, GSM, W-CDMA, CDMA, Wi-Fi) Closest Channel Number Number of Carriers Signal-to-Noise Ratio (SNR) > 10 dB Interference Mapping Triangulate location of interference with on display maps
--------------	--

Application Options	Bias-Tee (On/Off), Impedance (50 $\Omega$ , 75 $\Omega$ , Other)
---------------------	--

## GPS Receiver Option (Option 0031) (Antenna sold separately)

Setup	On/Off, Antenna Voltage 3.3/5.0 V, GPS Info
GPS Time/Location Indicator	Time, Latitude, Longitude and Altitude on display Time, Latitude, Longitude and Altitude with trace storage
High Frequency Accuracy	Spectrum Analyzer, Interference Analyzer, CW Signal Analyzers
when GPS Antenna is connected	< $\pm$ 50 ppb with GPS On, 3 minutes after satellite lock in selected mode
Connector	SMA, Female

## Spectrum Master™ MS2712E and MS2713E Specifications



### Channel Scanner (Option 0027)

Number of Channels	1 to 20 Channels
Measurements	Graph/Table, Max Hold (On/5 sec/Off), Freq/Channel, Current/Max, Single/Dual Color
Scanner	Scan Channels, Scan Frequencies, Scan Customer List, Scan Script Master™
Amplitude	Reference Level, Scale
Custom Scan	Signal Standard, Channel, # of Channels, Channel Step Size, Custom Scan
Frequency Range	100 kHz to 4 GHz (MS2712E), 100 kHz to 6 GHz (MS2713E)
Frequency Accuracy	± 10 Hz + Time base error
Measurement Range	-110 dBm to +26 dBm
Application Options	Bias-Tee (On/Off), Impedance (50 Ω, 75 Ω, Other)



### CW Signal Generator Option (Option 0028) (Requires Option 0021) (Requires CW Signal Generator Kit, P/N 69793)

#### Setup Parameters

Frequency	Frequency, Signal Standard, Channel Number, Display Setup Help
Amplitude	Power Level (Low/High), Offset (dB)
Frequency Range	2 MHz to 2 GHz
Frequency Reference	Accuracy: ± 1.5 ppm (25 °C ± 25 °C) + aging, < ± 50 ppb with GPS On
Output Power	High 0 dBm typical, Low -30 dBm typical Attenuator (included in kit 69793): 0 to 90 dB in 1 dB steps

### Gated Sweep (Option 0090)

Mode	Spectrum Analyzer, Sweep
Trigger	External TTL
Setup	Gated Sweep (On/Off) Gate Polarity (Rising, Falling) Gate Delay (0 ms to 65 ms typical) Gate Length (1 μs to 65 ms typical) Zero Span Time

### 20 MHz BW Demod (Option 0009)

Required for all signal analyzers except AM/FM/PM Signal Analyzer, Option 509

# Spectrum Master™ MS2712E and MS2713E Specifications



## Power Meter (Option 0029)

Frequency	Center/Start/Stop, Span, Frequency Step, Signal Standard, Channel #, Full Band
Amplitude	Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale
Average	Acquisition Fast/Med/Slow, # of Running Averages
Limits	Limit On/Off, Limit Upper/Lower
Frequency Range	10 MHz to 4 GHz (MS2712E), 10 MHz to 6 GHz (MS2713E)
Span	1 kHz to 100 MHz
Display Range	-140 dBm to +30 dBm, ≤ 40 dB span
Measurement Range	-120 dBm to +26 dBm
Offset Range	0 dB to +100 dB
VSWR	2:1 typical
Maximum Power	+30 dBm without attenuator
Accuracy	Same as Spectrum Analyzer
Application Options	Impedance (50 Ω, 75 Ω, Other)



## High Accuracy Power Meter (Option 0019) (Requires external USB Power Sensor(s))

Amplitude	Maximum, Minimum, Offset, Relative On/Off, Units, Auto Scale
Average	# of Running Averages, Max Hold
Zero/Cal	Zero On/Off, Cal Factor (Center Frequency, Signal Standard)
Limits	Limit On/Off, Limit Upper/Lower

Power Sensor Model	PSN50	MA24104A/05A	MA24106A	MA24108A/18A/26A
Description	High Accuracy RF Power Sensor	Inline High Power Sensor	High Accuracy RF Power Sensor	Microwave USB Power Sensor
Frequency Range	50 MHz to 6 GHz	600 MHz to 4 GHz (MA24104A) 350 MHz to 4 GHz (MA24105A)	50 MHz to 6 GHz	10 MHz to 8 GHz (MA24108A) 10 MHz to 18 GHz (MA24118A) 10 MHz to 26 GHz (MA24126A)
Connector	Type N(m), 50 Ω	Type N(m), 50 Ω (MA24104A) Type N(f), 50 Ω (MA24105A)	Type N(m), 50 Ω	Type N(m), 50 Ω (MA24108A/18A) Type K(m), 50 Ω (MA24126A)
Dynamic Range	-30 dBm to +20 dBm (.001 mW to 100 mW)	+3 dBm to +51.76 dBm (2 mW to 150 W)	-40 dBm to +23 dBm (0.1 μW to 200 mW)	-40 dBm to +20 dBm (0.1 μW to 100 mW)
VBW	100 Hz	100 Hz	100 Hz	50 kHz
Measurand	True-RMS	True-RMS	True-RMS	True-RMS, Slot Power, Burst Average Power
Measurement Uncertainty	± 0.16 dB <sup>1</sup>	± 0.17 dB <sup>2</sup>	± 0.16 dB <sup>1</sup>	± 0.18 dB <sup>3</sup>
Datasheet (for complete specifications)	11410-00414	11410-00483 (MA24104A) 11410-00621 (MA24105A)	11410-00424	11410-00504

- Notes:
- 1) Total RSS measurement uncertainty (0 °C to 50 °C) for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.
  - 2) Expanded uncertainty with K=2 for power measurements of a CW signal greater than +20 dBm with a matched load. Measurement results referenced to the input side of the sensor.
  - 3) Expanded uncertainty with K=2 for power measurements of a CW signal greater than -20 dBm with zero mismatch errors.



# Spectrum Master™ MS2712E and MS2713E Specifications



## LTE Signal Analyzers (Options 0541, 0542, 0546, 0551, 0552, 0556)

### Measurements

RF (Option 0541 FDD) (Option 0551 TDD)	Modulation (Option 0542 FDD) (Option 0552 TDD)	Over-the-Air (OTA) (Option 0546 FDD) (Option 0556 TDD)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time (TDD only) Frame View Sub-Frame View Total Frame Power DwPTS Power Transmit Off Power Cell ID Timing Error ACPR Spectral Emission Mask Category A or B (Opt 1) RF Summary	Power vs. Resource Block (RB) RB Power (PDSCH) Active RBs, Utilization % Channel Power, Cell ID OSTP, EVM (FDD only) Constellation QPSK, 16 QAM, 64 QAM Modulation Results Ref Signal Power (RS) Sync Signal Power (SS) EVM – rms, peak, max hold Frequency Error – Hz, ppm Carrier Frequency Cell ID Control Channel Power Bar Graph or Table View RS, P-SS, S-SS PBCH, PCFICH Total Power (Table View) Modulation Results Modulation Summary Includes EVM by modulation (FDD only) Antenna Icons Detects active antennas (1/2)	Scanner Cell ID (Group, Sector) S-SS Power, RSRP, RSRQ, SINR Dominance Modulation Results – On/Off Tx Test Scanner RS Power of MIMO antennas Cell ID, Average Power Delta Power (Max-Min) Graph of Antenna Power Modulation Results – On/Off Mapping On-screen S-SS Power, RSRP, RSRQ, or SINR Scanner Modulation Results – Off	View Pass/Fail Limits All, RF, Modulation  Available Measurements Channel Power Occupied Bandwidth ACLR Frequency Error Carrier Frequency Dominance EVM peak, rms RS Power SS, P-SS, S-SS Power PBCH Power PCFICH Power Cell, Group, Sector ID Frame Power (TDD only) DwPTS Power (TDD only) Transmit Off Power (TDD only) Timing Error (TDD only)

### Setup Parameters

Frequency	E-UTRA FDD bands 1 - 5, 7 - 14, 17 - 21, 23 - 25 (tunable 10 MHz to 4.0 GHz) E-UTRA TDD bands 33 - 43 (tunable 10 MHz to 4.0 GHz) Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Bandwidth	1.4, 3, 5, 10, 15, 20 MHz
Span	Auto, 1.4, 3, 5, 10, 15, 20, 30 MHz
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
EVM Mode	Auto, PBCH only
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

### RF Measurements (Options 0541, 0551)

RF Channel Power Accuracy	± 1.5 dB, ± 1.0 dB typical, (RF input -50 dBm to +10 dBm) (Option 0541) ± 1.5 dB, ± 1.0 dB typical, (RF input -30 dBm to +10 dBm) (Option 0551)
---------------------------	--

### Modulation Measurements (Options 0542, 0552)

Frequency Error	± 10 Hz + time base error, 99% confidence level
Residual EVM (rms) (FDD only)	2.0% typical (E-UTRA Test Model 3.1, RF Input -50 dBm to +10 dBm) for BW ≤ 10 MHz 2.5% typical (E-UTRA Test Model 3.1, RF Input -50 dBm to +10 dBm) for BW > 10 MHz
Residual EVM (rms) (TDD only)	2.0% typical (E-UTRA Test Model 3.1, RF Input -30 dBm to +10 dBm) for BW ≤ 10 MHz 2.5% typical (E-UTRA Test Model 3.1, RF Input -30 dBm to +10 dBm) for BW > 10 MHz

### Over-the-Air (OTA) Measurements (Options 0546, 0556)

Scanner	Six strongest signals if present Auto Save – Sync Signal Power and Modulation Results with GPS tagging
Auto Save	Scanner – three strongest signals if present RS Power – strongest signal
Mapping	Map On-screen S-SS Power, RSRP, RSRQ, or SINR of Cell ID with strongest signal Scanner – three strongest signals if present Save and Export Scanner data: *.kml, *.mtd (tab delimited)

# Spectrum Master™ MS2712E and MS2713E Specifications



## TD-SCDMA/HSPA+ Signal Analyzers (Options 0060, 0061, 0038)

Measurements			
RF (Option 0060)	Demodulation (Option 0061)	Over-the-Air (OTA) (Option 0038)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Left Channel Power Left Channel Occ B/W Right Channel Power Right Channel Occ B/W Power vs. Time Six Slot Powers Channel Power (RRC) DL-UL Delta Power UpPTS Power DwPTS Power On/Off Ratio Slot Peak-to-Average Power Spectral Emission RF Summary	Code Domain Power/Error (QPSK/8 PSK/16 QAM) Slot Power DwPTS Power Noise Floor Frequency Error Tau Scrambling Code EVM Peak EVM Peak Code Domain Error Modulation Summary	Code Scan (32) Scrambling Code Group Tau E <sub>c</sub> /I <sub>o</sub> Pilot Dominance Tau Scan (Six) Sync-DL# Tau E <sub>c</sub> /I <sub>o</sub> DwPTS Power Pilot Dominance	Occupied Bandwidth Channel Power Channel Power RCC On/Off Ratio Peak-to-Average Ratio Frequency Error EVM Peak EVM Peak Code Domain Error Tau Noise Floor
Setup Parameters			
	Slot Selection	Auto, 0-6	
	Trigger	Trigger Type (No Trigger/GPS/External), External Trigger (Rising/Falling), Tau Offset	
	SYNC-DL Code	Auto, 0-31	
	Scrambling/Midamble Code	Auto, 0-127	
	Maximum Users	Auto, 2, 4, 6, 8, 10, 12, 14, 16	
	Measurement Speed	Fast, Normal, Slow	
	User Selectable	Uplink Switch Point, Number of Carriers (1, 3), Tau Offset	
	Demodulation Type	Auto, QPSK, 8 PSK, 16 QAM	
	Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel	
	Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)	
	Sweep	Hold/Run, Trigger Sweep	
	Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory	
	Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements	
RF Measurements (Option 0060) (temperature range 15 °C to 35 °C)			
	RF Channel Power Accuracy (RRC)	± 1.5 dB, ±1.0 dB typical, (slot power -40 dBm to +10 dBm)	
	Frequency Error	± 10 Hz + time base error, in the presence of a downlink slot	
Demodulation (Option 0061) (temperature range 15 °C to 35 °C)			
	Supported Modulation	QPSK, 8 PSK, 16 QAM	
	Residual EVM (rms)	3% typical, P-CCPH slot power > -50 dBm	
	PN Offset	Within 1 x 64 chips	
	Pilot Power Accuracy	± 1.0 dB typical	
	Timing Error (Tau) for Dominant SYNC-DL	± 0.2 µs (external trigger)	
	Spreading Factor	1, 16	
Over-the-Air (OTA) Measurements (Option 0038)			
	Code Scanner	32 Sync Codes and associated Scrambling Code Groups	
	Tau Scanner	Six strongest Sync Codes	
	Auto Save	Yes	
	GPS Logging	Yes	

# Spectrum Master™ MS2712E and MS2713E Specifications



## GSM/EDGE Signal Analyzers (Options 0040, 0041)

### Measurements

RF (Option 0040)	Demodulation (Option 0041)	Over-the-Air (OTA)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Burst Power Average Burst Power Frequency Error Modulation Type BSIC (NCC, BCC) Multi-channel Spectrum Power vs. Time (Frame/Slot) Channel Power Occupied Bandwidth Burst Power Average Burst Power Frequency Error Modulation Type BSIC (NCC, BCC)	Phase Error EVM Origin Offset C/I Modulation Type Magnitude Error BSIC (NCC, BCC)	There are no additional OTA Measurements.  RF Measurements and Demodulation can be made OTA	Channel Power Occupied Bandwidth Burst Power Average Burst power Frequency Error Phase Error EVM Origin Offset C/I Magnitude Error

### Setup Parameters

GSM/EDGE Select	Auto, GSM, EDGE
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

### RF Measurements (Option 0040) (temperature range 15 °C to 35 °C)

Frequency Error	± 10 Hz + time base error, 99% confidence level
Occupied Bandwidth	Bandwidth within which 99% of the power transmitted on a single channel lies
Burst Power Error	± 1.5 dB, ± 1 dB typical, (-50 dBm to +20 dBm)

### Demodulation (Option 0041) (temperature range 15 °C to 35 °C)

GSMK Modulation Quality (RMS Phase)	
Measurement Accuracy	± 1 deg
Residual Error (GSMK)	1 deg
8 PSK Modulation Quality (EVM)	
Measurement Accuracy	± 1.5%
Residual Error (8 PSK)	2.5%

# Spectrum Master™ MS2712E and MS2713E Specifications



## W-CDMA/HSPA+ Signal Analyzers (Options 0044, 0065, or 0035)

Measurements			
RF (Option 0044)	Demodulation (Option 0065)	Over-the-Air (OTA) (Option 0035)	Pass/Fail (User Editable)
Band Spectrum Channel Spectrum Channel Power Occupied Bandwidth Peak-to-Average Power Spectral Emission Mask Single carrier ACLR Multi-carrier ACLR RF Summary	Code Domain Power Graph P-CPICH Power Channel Power Noise Floor EVM Carrier Feed Through Peak Code Domain Error Carrier Frequency Frequency Error Control Channel Power Abs/Rel/Delta Power CPICH, P-CCPCH S-CCPCH, PICH P-SCH, S-SCH HSPA+ Power vs. Time Constellation Code Domain Power Table Code, Status EVM, Modulation Type Power, Code Utilization Power Amplifier Capacity Codogram Modulation Summary	Scrambling Code Scanner (Six) Scrambling Codes CPICH $E_c/I_o$ $E_c$ Pilot Dominance OTA Total Power Multipath Scanner (Six) Six Multipaths Tau Distance RSCP Relative Power Multipath Power	Max Output Power Frequency Error EVM CPICH Occupied Bandwidth Spectral Mask ACLR PCDE P-CCPCH S-CCPCH Code Spread 3 PICH Code 128 Test Models 1 (16), (32), (64) 2 3 (16), (32) 4 (+CPICH), (-CPICH) 5 (2 HS), (4 HS), (8 HS)
<b>Setup Parameters</b>			
Scrambling Code, Threshold	Auto, Manual		
User Selectable	Scrambling Code, S-CCPCH Spread, S-CCPCH Code, PICH Code, Threshold, Max Amp Power, CPICH Power, Frequency Error Average		
Maximum Spreading Factor	256, 512		
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel		
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)		
Marker	Six Markers, Table On/Off		
Sweep	Single/Continuous, Trigger Sweep		
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory		
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements		
<b>RF Measurements (Option 0044)</b> (temperature range 15 °C to 35 °C)			
Frequency Range	Bands I – XIV, XVII		
RF Channel Power Accuracy	$\pm 1.25$ dB, $\pm 0.7$ dB typical, (temperature range 15 °C to 35 °C)		
Occupied Bandwidth Accuracy	$\pm 100$ kHz		
Adjacent Channel Leakage Ratio (ACLR)	–54 dB/–59 dB $\pm 0.8$ dB @ 5 MHz/10 MHz offset, typical, Bands I – VI, VIII – XIV, XVII –54 dB/–57 dB $\pm 1.0$ dB @ 5 MHz/10 MHz offset, typical, Band VII		
<b>Demodulation (Option 0065)</b>			
W-CDMA Modulations	QPSK, QPSK-DTX (Codecs: AMR 4.75, 5.9, 7.4, 12.2 kbps, DTX 7.4, 12.2 kbps)		
HSPA+ Modulations	QPSK, 16 QAM, 64 QAM		
EVM Accuracy	$\pm 2.5$ %, $6\% \leq \text{EVM} \leq 25\%$		
Residual EVM	2.5% typical		
Code Domain Power	$\pm 0.5$ dB for code channel power $> -25$ dB, 16, 32, 64 DCPH (test model 1), 16, 32 DCPH (test model 2, 3)		
CPICH (dBm) Accuracy	$\pm 0.8$ dB typical		
<b>Over-the-Air (OTA) Measurements (Option 0035)</b>			
Scrambling Code Scanner	Six strongest Scrambling Codes		
Multipath Scanner	Six multipaths' power relative to strongest pilot		

# Spectrum Master™ MS2712E and MS2713E Specifications



## CDMA Signal Analyzers (Option 0042, 0043, 0033)

### Measurements

RF (Option 0042)	Demodulation (Option 0043)	Over-the-Air (OTA) (Option 0033)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Peak-to-Average Power Spectral Emission Mask Multi-carrier ACPR RF Summary	Code Domain Power Graph Pilot Power Channel Power Noise Floor Rho Carrier Feed Through Tau RMS Phase Error Frequency Error Abs/Rel/ Power Pilot Page Sync Q Page Code Domain Power Table Code Status Power Multiple Codes Code Utilization Modulation Summary	Pilot Scanner (Nine) PN $E_c/I_o$ Tau Pilot Power Channel Power Pilot Dominance Multipath Scanner (Six) $E_c/I_o$ Tau Channel Power Multipath Power Limit Test – 10 Tests Averaged Rho Adjusted Rho Multipath Pilot Dominance Pilot Power Pass/Fail Status	Channel Power Occupied Bandwidth Peak-to-Average Power Spectral Mask Test Frequency Error Channel Frequency Frequency error Pilot Power Noise Floor Rho Carrier Feed Through Tau RMS Phase Error Code Utilization Measured PN Pilot Dominance Multipath Power

### Setup Parameters

PN Setup	PN Trigger (No Trigger, GPS, External), PN Search Type (Auto, Manual), PN Offset
Walsh Codes	64, 128
Measurement Speed	Fast, Normal, Slow
External Trigger Polarity	Rising, Falling
Number of Carriers	1 to 5
Carrier Bandwidth	1.23, 1.24, 1.25 MHz
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

### RF Measurements (Option 0042) (temperature range 15 °C to 35 °C)

RF Channel Power Accuracy	± 1.5 dB, ± 1.0 dB typical, (RF input -50 dBm to +20 dBm)
---------------------------	---

### Demodulation (Option 0043) (temperature range 15 °C to 35 °C)

Frequency Error	± 10 Hz + time base error, 99% confidence level (in slow mode)
Rho Accuracy	± 0.005, for Rho > 0.9
Residual Rho	> 0.995, typical, > 0.99 maximum, (RF input -50 dBm to +20 dBm)
PN Offset	1 x 64 chips
Pilot Power Accuracy	± 1.0 dB typical, relative to channel power
Tau	± 0.5 µs typical, ± 1.0 µs maximum

### Over-the-Air (OTA) Measurements (Option 0033)

Pilot Scanner	Nine strongest pilots
Multipath Scanner	Six multipaths' power relative to strongest pilot
Limit Test	Average of ten tests compared to limit



# Spectrum Master™ MS2712E and MS2713E Specifications



## EV-DO Signal Analyzers (Option 0062, 0063, 0034)

Measurements			
RF (Option 0062)	Demodulation (Option 0063)	Over-the-Air (OTA) (Option 0034)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Peak-to-Average Power Power vs. Time Pilot & MAC Power Channel Power Frequency Error Idle Activity On/Off Ratio Spectral Emission Mask Multi-carrier ACPR RF Summary	MAC Code Domain Power Graph Pilot & MAC Power Channel Power Frequency Error Rho Pilot Rho Overall Data Modulation Noise Floor MAC Code Domain Power Table Code Status Power Code Utilization Data Code Domain Power Active Data Power Data Modulation Rho Pilot Rho Overall Maximum Data CDP Minimum Data CDP Modulation Summary	Pilot Scanner (Nine) PN E <sub>c</sub> /I <sub>o</sub> Tau Pilot Power Channel Power Pilot Dominance Multipath Scanner (Six) E <sub>c</sub> /I <sub>o</sub> Tau Channel Power Multipath Power	Channel Power Occupied Bandwidth Peak-to-Average Power Carrier Frequency Frequency Error Spectral Mask Noise Floor Pilot Power RMS Phase Error Tau Code Utilization Measured PN Pilot Dominance Multipath Power
Setup Parameters			
	PN Setup	PN Trigger (No Trigger, GPS, External), PN Search Type (Auto, Manual), PN Offset	
	Walsh Codes	64, 128	
	Measurement Speed	Fast, Normal, Slow	
	External Trigger Polarity	Rising, Falling	
	Slot Type	Auto, Active, Idle	
	Number of Carriers	1 to 5	
	Carrier Bandwidth	1.23, 1.24, 1.25 MHz	
	Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel	
	Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range, Units (dBm/Watts)	
	Sweep	Single/Continuous, Trigger Sweep	
	Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory	
	Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements	
RF Measurements (Option 0062) (temperature range 15 °C to 35 °C)			
	RF Channel Power Accuracy	± 1.5 dB, ± 1.0 dB typical, (RF input -50 dBm to +20 dBm)	
Demodulation (Option 0063) (temperature range 15 °C to 35 °C)			
	EV-DO Compatibility	Rev 0 and Rev A	
	Frequency Error	± 10 Hz + time base error, 99% confidence level	
	Rho Accuracy	± 0.01, for Rho > 0.9	
	Residual Rho	> 0.995 typical, > 0.99, maximum (RF input -50 dBm to +20 dBm)	
	PN Offset	Within 1 x 64 chips	
	Pilot Power Accuracy	± 1.0 dB typical, relative to channel power	
	Tau	± 0.5 μs typical, ±1.0 μs maximum	
Over-the-Air (OTA) Measurements (Option 0034)			
	Pilot Scanner	Nine strongest pilots	
	Multipath Scanner	Six multipaths' power relative to strongest pilot	

# Spectrum Master™ MS2712E and MS2713E Specifications



## Fixed WiMAX Signal Analyzers (Options 0046, 0047)

### Measurements

RF (Option 0046)	Demodulation (Option 0047)	Over-the-Air (OTA)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time Channel Power Preamble Power Data Burst Power Crest Factor ACPR RF Summary	Constellation RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error Carrier Frequency Base Station ID Spectral Flatness Adjacent Subcarrier Flatness EVM vs. Subcarrier/Symbol RCE EVM Frequency Error Carrier Frequency Base Station ID Modulation Summary	There are no additional OTA Measurements.  RF Measurements and Demodulation can be made OTA	Channel Power Occupied Bandwidth Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Base Station ID

### Setup Parameters

Bandwidth	1.25, 1.50, 2.50, 3.50, 5.00, 5.50, 6.00, 7.00, 10.00 MHz
Cyclic Prefix Ratio (CP)	1/4, 1/8, 1/16, 1/32
Span	5, 10, 15, 20 MHz
Frame Length	2.5, 5.0, 10.0 msec
Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel
Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range
Sweep	Single/Continuous, Trigger Sweep
Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory
Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements

### RF Measurements (Option 0046) (temperature range 15 °C to 35 °C)

RF Channel Power Accuracy	± 1.5 dB, ± 1.0 dB typical, (RF input -50 dBm to +20 dBm)
---------------------------	---

### Demodulation (Option 0047) (temperature range 15 °C to 35 °C)

Frequency Error	0.07 ppm + time base error, 99% confidence level
Residual EVM (rms)	3 % typical, 3.5 % maximum (RF Input -50 dBm to +20 dBm)

# Spectrum Master™ MS2712E and MS2713E Specifications



## Mobile WiMAX Signal Analyzers (Options 0066, 0067, 0037)

Measurements			
RF (Option 0066)	Demodulation (Option 0067)	Over-the-Air (OTA) (Option 0037)	Pass/Fail (User Editable)
Channel Spectrum Channel Power Occupied Bandwidth Power vs. Time Channel Power Preamble Power Downlink Burst Power Uplink Burst Power ACPR RF Summary	Constellation RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error CINR Base Station ID Sector ID Spectral Flatness Adjacent Subcarrier Flatness EVM vs. Subcarrier/Symbol RCE (RMS/Peak) EVM (RMS/Peak) Frequency Error CINR Base Station ID Sector ID DL-MAP (Tree View) Modulation Summary	Channel Power Monitor Preamble Scanner (Six) Preamble Relative Power Cell ID Sector ID PCINR Dominant Preamble Base Station ID	Channel Power Occupied Bandwidth Downlink Bust Power Uplink Burst Power Preamble Power Crest Factor Frequency Error Carrier Frequency EVM RCE Sector ID
<b>Setup Parameters</b>			
	Zone Type	PUSC	
	DL-MAP Auto Decoding	Convolutional Coding (CC), Convolutional Turbo Coding (CTC)	
	Bandwidths	3.50, 5.00, 7.00, 8.75, 10.00 MHz	
	Cyclic Prefix Ratio (CP)	1/8	
	Span	5, 10, 20, 30 MHz	
	Frame Lengths	5, 10 msec	
	Demodulation	Auto, Manual, FCH	
	Frequency	Center, Signal Standard, Channel #, Closest Channel, Decrement/Increment Channel	
	Amplitude	Scale/Division, Power Offset, Auto Range, Adjust Range	
	Sweep	Single/Continuous, Trigger Sweep	
	Save/Recall	Setup, Measurement, Screen Shot (save only), to Internal/External Memory	
	Measurement Summary Screens	Overall Measurements, RF Measurements, Signal Quality Measurements	
<b>RF Measurements (Option 0066)</b> (temperature range 15 °C to 35 °C)			
	RF Channel Power Accuracy	± 1.5 dB, ± 1.0 dB typical, (RF input -50 dBm to +20 dBm)	
<b>Demodulation (Option 0067)</b> (temperature range 15 °C to 35 °C)			
	Frequency Error	0.02 ppm + time base error, 99% confidence level	
	Residual EVM (rms)	2.5 % typical, 3.0 % maximum, (RF Input -50 dBm to +20 dBm)	
<b>Over-the-Air (OTA) Measurements (Option 0037)</b>			
	Channel Power Monitor	Over time (one week), measurement time interval 1 to 60 sec	
	Preamble Scanner	Six Strongest Preambles	
	Auto Save	Yes	
	GPS Logging	Yes	

# Spectrum Master™ MS2712E and MS2713E Specifications



## P25 Tx Signal Analyzer and P25 Talk-Out Coverage (Options 0520, 0522)

### Measurements

#### P25 Tx Signal Analyzer (Option 0520)

Received Power  
Frequency Error  
Modulation Fidelity  
NAC (hex)  
Symbol Rate Error  
BER (1011 Hz, 0.153, Voice, and Control Channel)

#### P25 Talk-Out Coverage (Option 0522)

BER  
RSSI  
Modulation Fidelity

### Graphs

#### P25 Tx Signal Analyzer (Option 0520)

Constellation  
Linear Constellation  
Spectrum (25 kHz span)  
Histogram  
Eye Diagram  
Summary Display

#### P25 Talk-Out Coverage (Option 0522)

RSSI vs. Time  
BER vs. Time  
Modulation Fidelity vs. Time

### Setup Parameters

Frequency	Center Frequency
Amplitude	Reference level, Scale, Ext Attenuation, Auto Range, Adjust Range
Setup	Modulation Type (C4FM, CQPSK), BER pattern (1011 Hz, 0.153, Voice, Control Channel)
Measurement	P25 Analyzer, P25 Coverage
P25 Analyzer	Active Graph, Maximize Active Trace, Graph Type, Symbol Span
Graph Type	Constellation, Linear Constellation, Spectrogram, Histogram, Eye Diagram, Summary
Symbol Span	2, 3, 4, 5
P25 Coverage (Option 522)	USB Memory File Format .p25, .km, both Log data on / off Display, RSSI vs. Time, BER vs. Time, Mod Fid. vs. Time

### RF Measurements (Option 0520) (temperature range 15 °C to 35 °C)

Received Power dBm	± 1.25 dB, ± 0.5 dB typical
Frequency Error Hz	± 10 Hz + Frequency Reference
Modulation Fidelity %	
BER/MER %	
Symbol Deviation Hz	
Network Access Code Hex	
Symbol Rate Error mHz	

### Measurements (Option 0522)

RSSI, BER, Mod Fid vs. Time

# Spectrum Master™ MS2712E and MS2713E Specifications



## NXDN Tx Signal Analyzer and NXDN Talk-Out Coverage (Options 0530, 0532)

Measurements	
NXDN Tx Signal Analyzer (Option 0530)	NXDN Talk-Out Coverage (Option 0532)
Received Power Frequency Error Modulation Fidelity RAN (hex) Symbol Rate Error BER (Tone, O.153, Voice, and Control Channel)	BER RSSI Modulation Fidelity
Graphs	
NXDN Tx Signal Analyzer (Option 0530)	NXDN Talk-Out Coverage (Option 0532)
Constellation Linear Constellation Spectrum (25 kHz span) Histogram Eye Diagram Summary Display	RSSI vs. Time BER vs. Time Modulation Fidelity vs. Time
Setup Parameters	
Frequency	Center Frequency
Amplitude	Reference level, Scale, Ext Attenuation, Auto Range, Adjust Range
Setup	Modulation Bandwidth (6.25 kHz and 12.5 kHz), BER pattern (Tone, O.153, Voice, Control Channel)
Measurement	NXDN Analyzer, NXDN Coverage
NXDN Analyzer	Active Graph, Maximize Active Trace, Graph Type, Symbol Span
Graph Type	Constellation, Linear Constellation, Spectrogram, Histogram, Eye Diagram, Summary
Symbol Span	2, 3, 4, 5
NXDN Coverage (Option 0532)	USB Memory File Format .nxdn, .kml, both Log data on / off Display, RSSI vs. Time, BER vs. Time, Mod Fid. vs. Time
RF Measurements (Option 0530) (temperature range 15 °C to 35 °C)	
Received Power dBm	± 1.25 dB, ± 0.5 dB typical
Frequency Error Hz	± 10 Hz + Frequency Reference
Modulation Fidelity %	
BER/MER %	
Symbol Deviation Hz	
Radio Access Number Hex	
Symbol Rate Error mHz	
Measurements (Option 0532)	
RSSI, BER, Mod Fid vs. Time	



# Spectrum Master™ MS2712E and MS2713E Specifications



## ISDB-T Measurements(Options 0030, 0079, 0032)

For full specifications refer to the Digital Broadcast Analysis Options Technical Data Sheet 11410-00624

### Measurements

ISDB-T RF (Option 0030)	ISDB-T Signal Analysis (Option 0030)	ISDB-T BER Analysis (Option 0079)	ISDB-T SFN Analysis (Option 0032)
Signal Power Channel Power Termination Voltage Open Terminal Voltage Field Strength Spectrum Monitor Channel Power Zone Center Channel Zone Center Frequency Spectrum Mask Mask (Standard A) Japan Mask (Standard B) Japan Mask (Critical) Brazil Mask (Sub-critical) Brazil Mask (Non-critical) Brazil Phase Noise Spurious Emissions	Constellation (w/zoom) Layer A, B, C, TMCC Sub-carrier MER Delay Profile (w/zoom) Frequency Response Measured Data Frequency Frequency Offset MER (Total, Layer A/B/C, TMCC, AC1) Modulation (Layer A/B/C) Mode, GI Sub-carrier MER w/marker Delay w/marker Frequency Response w/marker	Layer A, Layer B, Layer C BER and Error Count per Layer Before RS Before Viterbi PER and Error Count per Layer MPEG Bit Rate per Layer TMCC Information per Layer Modulation Code Rate Interleave Segments Channel Power Mode, GI Signal Sync Status ASI Out	Impulse Response (w/zoom) In-band Spectrum Measured Data Channel Power Delay DU Ratio Power Field Strength
ISDB-T Measurement Modes Custom: User specified measurement and setup parameters Easy: User specified measurements. Some setup parameters are automatically set or detected Batch: User specified measurements and channels for automatic measurement, results' display and storage			

### Setup Parameters

Channel Map	UHF (Japan), UHF (Brazil), IF (37.15 MHz), None
Channel	13 to 62 (Japan), 14 to 69 (Brazil)
Frequency	35 MHz to 806 MHz
Bandwidths	6 MHz, 8 MHz
Partial Reception	Recognized when layer A segment count is 1
One-Seg	On: synchronizes with single segment transmission (Bandwidth 6 MHz only) Off: synchronizes with normal 13 segment signal
Pre-amp	On, Off
Reference Level Setting	-25 dBm to -20 dBm/5 dB steps (Preamp Off), -50 dBm to -10 dBm/10 dB steps (Preamp On)

### ISDB-T Digital Video Measurements (Option 0030)

Channel Power Accuracy	± 2 dB, (RF input -84 dBm to -10 dBm)
Frequency Lock Range	± 90 kHz
Frequency Offset Accuracy	± (measurement frequency x reference frequency accuracy) ± 0.3 Hz
Residual MER	≥ 42 dB, typical (Preamp Off, Reference level: -20 dBm) ≥ 37 dB, typical (Preamp On, Reference level: -50 dBm)
Sub-carrier MER Display Range	± 2.785 MHz from center frequency (Bandwidth 6 MHz) ± 3.714 MHz from center frequency (Bandwidth 8 MHz)
Delay Profile Resolution	0.12 µs (Bandwidth 6 MHz) 0.09 µs (Bandwidth 8 MHz)
Frequency Response Resolution	1 kHz, 0.1 dB
Phase Noise Range	-40 dBc/Hz to -140 dBc/Hz
Spurious Emissions Search Range	5 MHz to 5x input signal frequency

### ISDB-T BER Measurements (Option 0079)

BER Measurement Display per Layer	Rate and Error count: Before Viterbi, Before RS
PER Measurement Display per Layer	Rate and Error count
TMCC Information Display per Layer	Modulation, Code Rate, Interleave, Number of segments
ASI Output	BNC-J 75 Ω

### ISDB-T SFN Measurements (Option 0032)

Delay Profile Display Range	-1008 µs to +1008 µs
Delay Wave Estimated Level Accuracy	± 2.5 dB typical (-10 dBm to -79 dBm)
DU Ratio Accuracy	± 1 dB typical (-10 dBm to -70 dBm)
Inband Spectrum Range	± 2.74 MHz (Mode 2), ± 2.76 MHz (Mode 3)

# Spectrum Master™ MS2712E and MS2713E Specifications



## DVB-T/H (Options 0064, 0057, 0078)

For full specifications refer to the Digital Broadcast Analysis Options Technical Data Sheet 11410-00624

### Measurements

DVB-T/H RF (Option 0064)	DVB-T/H Signal Analysis (Option 0064)	DVB-T/H BER Analysis (Option 0057)	DVB-T/H SFN Analysis (Option 0078)
Signal Power	Composite or Individual Views	BER	Impulse Response (w/zoom)
Channel Power	Constellation	Before RS	Inband Spectrum
Termination Voltage	Impulse Response (w/zoom)	Before Viterbi	Measured Data
Open Terminal Voltage	Carrier MER (w/zoom)	PER (Packet)	Channel Power
Field Strength	Freq Response	Channel Power	Delay
Spectrum Monitor	(composite view only)	MER (Quick)	DU Ratio
Channel Power	Measured Data	Bit Rate	Power
Zone Center Channel	Mode, GI	TPS Info	Field Strength
Zone Center Frequency	Modulation	Length Indicator	
Shoulder Attenuation	Hierarchy	Mode, GI	
Channel Power	Freq Offset	Modulation	
Zone Center Channel	Channel Power	Hierarchy	
Zone Center Frequency	MER (Total/Data/TPS)	Interleave Type	
Lower Shoulder Attenuation	TPS Warning Message	Cell ID	
Upper Shoulder Attenuation	TPS Info	Code Rate	
	Interleave Type	Time Slicing	
	Cell ID	MPE-FEC	
	Code Rate (HP/LP)	TPS Warning Message	
	Time Slicing (HP/LP)	ASI Out	
	MPE-FEC (HP/LP)		

### Setup Parameters

Channel Map	UHF (Australia), UHF (Europe), VHF (Europe), None
Channel	28 to 69 (Australia), 21 to 69 (Europe), 5 to 12 (Europe)
Frequency Offset	± 166.666 kHz, ± 333.333 kHz, ± 499.999 kHz, None
Frequency	30 MHz to 990 MHz when Channel Map is None
Bandwidth	5, 6, 7, 8 MHz
Pre-amp	On, Off
Reference Level	-25 dBm to +20 dBm/5 dB steps (Preamp Off), -50 dBm to -10 dBm/10 dB steps (Preamp On)

### DVB-T/H Digital Video Measurements (Option 0064)

Channel Power Accuracy	± 2 dB, (RF input -84 dBm to -10 dBm)
Frequency Lock Range	± 90 kHz
Frequency Offset Accuracy	± (measurement frequency x reference frequency accuracy) ± 0.3 Hz
Residual MER	≥ 42 dB (Preamp Off, Reference Level: -20 dBm) ≥ 37 dB (Preamp On, Reference Level: -50 dBm)
Impulse Response Resolution	0.11 µs (Bandwidth: 8 MHz), 0.1 dB
Carrier MER Marker	Carrier Number, Offset Frequency and MER
Composite View	Simultaneous display of Constellation (Data and TPS), Impulse Response, Carrier MER and Frequency Response

### DVB-T/H BER Measurements (Option 0057)

Bit Count Setting	Range 1E+6 to 1E+12
Service Type	In Service: BER measurement of normal in-service data traffic Simultaneous BER measurement Before Viterbi and Before RS error correction Out of Service: BER measurement of a PRBS23 data sequence BER measurement point can be selected Before Viterbi, Before RS or After RS
TPS Information	Length indicator, Mode, GI, Modulation, Hierarchy, Inner Interleave, Cell ID, Code Rate, Time Slicing, MPE-FEC
ASI Output	BNC-J 75 Ω

### DVB-T/H SFN Measurements (Option 0078)

Impulse Response Display Range	-896 µs to +896 µs (Bandwidth: 8 MHz)
Resolution	0.11 µs (33 m) (Bandwidth: 8 MHz)
Marker	Delay time, relative level (DU ratio), power and field strength or termination voltage
Inband Spectrum Range	± 3.804 MHz (Bandwidth: 8 MHz)

# Spectrum Master™ MS2712E and MS2713E Specifications



## AM/FM/PM Signal Analyzers (Option 0509)

### Measurements

	RF Spectrum AM/FM/PM	Audio Spectrum (AM)	Audio Spectrum (FM/PM)	Audio Waveform (AM)	Audio Waveform (FM/PM)	Summary (AM)	Summary (FM/PM)
Graphic Display	Power (dBm) vs. Frequency	Depth (%) vs. Modulation Frequency	Deviation (kHz/rad) vs. Modulation Frequency	Depth (%) vs. Time	Deviation (kHz/rad) vs. Time	None	None
Numerical Displays	Carrier Power Carrier Frequency Occupied Bandwidth	AM Rate RMS Depth (Pk-Pk)/2 Depth SINAD* THD* Distortion/Total Vrms*	FM/PM Rate RMS Deviation (Pk-Pk)/2 Deviation SINAD* THD* Distortion/Total Vrms*	AM Rate RMS Depth (Pk-Pk)/2 Depth SINAD* THD* Distortion/Total Vrms*	FM/PM Rate RMS Depth (Pk-Pk)/2 Depth SINAD* THD* Distortion/Total Vrms*	RMS Depth (AM) Peak + Depth Peak - Depth (Pk-Pk)/2 Depth Carrier Power Carrier Frequency Occupied Bandwidth AM Rate SINAD* THD* Distortion/Total Vrms*	RMS Deviation (FM/PM) Peak + Depth Peak - Depth (Pk-Pk)/2 Depth Carrier Power Carrier Frequency Occupied Bandwidth AM Rate SINAD* THD* Distortion/Total Vrms*

### Setup Parameters

Frequency	Center Freq, Span, Freq Step, Signal Standard, Channel, Channel Increment, Set Carrier Freq
Amplitude	Scale, Power Offset, Adjust Range
Setup	Demod Type (AM, FM, PM), IFBW, Auto IFBW
Measurements	RF Spectrum AM/FM/PM, Audio Spectrum (AM/FM/PM), Audio Waveform (AM/FM/PM), Summary (AM/FM/PM), Average
Marker	On/Off, Delta, Peak Search, Marker Freq to Center, Marker to Ref Lvl, Marker Table, All Markers Off

### Specifications

AM	Modulation Rate: $\pm 1$ Hz (< 100 Hz), $\pm 2\%$ (> 100 Hz) Depth: $\pm 5\%$ for (Modulation rates 10 Hz to 100 kHz)
FM	Modulation Rate: $\pm 1$ Hz (< 100 Hz); $\pm 2\%$ (100 Hz to 100 kHz) Deviation Accuracy: $\pm 5\%$ (100 Hz to 100 kHz)**
PM	Modulation Rate: $\pm 1$ Hz (< 100 Hz); $\pm 2\%$ (100 Hz to 100 kHz) Deviation Accuracy: $\pm 5\%$ (deviation 0 to 93 Rad, rate 10 Hz to 5 kHz)**
IF bandwidth	1 kHz to 300 kHz in 1-3 sequence
Frequency Span	RF Spectrum: 10 kHz to 10 MHz Audio Spectrum: 2 kHz, 5 kHz, 10 kHz, 20 kHz
RBW/VBW	30
Span/RBW	100
Sweep time	50 $\mu$ s to 50 ms (Audio Waveform)

\* Requires Sinewave modulation

\*\* IFBW must be greater than 95% occupied BW

# Spectrum Master™ MS2712E and MS2713E Specifications

## General Specifications

All specifications and characteristics apply under the following conditions, unless otherwise stated: 1) After 5 minutes of warm-up time, where the instrument is left in the ON state; 2) All specifications apply when using internal reference; 3) All specifications subject to change without notice; 4) Typical performance is the measured performance of an average unit; 5) Recommended calibration cycle is 12 months; 6) Performance Sweep Mode.

### Setup Parameters

System	Status (Temperature, Battery Info, Serial Number, Firmware Version, Options Installed) Self Test, Application Self Test GPS (see Option 0031)
System Options	Name, Date and Time, Brightness, Volume Language (English, French, German, Spanish, Chinese, Japanese, Korean, Italian, User defined) Reset (Factory Defaults, Master Reset, Update Firmware)
File	Save, Recall, Delete, Directory Management
Save/Recall	Setups, Measurements, Screen Shots Jpeg (save only)
Delete	Selected File, All Measurements, All Mode Files, All Content
Directory Management	Sort Method (Name/Type/Date), Ascend/Descend, Internal/USB, Copy, Format USB
Internal Trace/Setup Memory	2,000 traces, 2,000 Setups
External Trace/Setup Memory	Limited by size of USB Flash drive
Mode Switching	Auto-Stores/Recalls most recently used Setup Parameters in the Mode

### Connectors

RF Out	Type N, female, 50 $\Omega$
RF Out Damage Level	23 dBm, $\pm$ 50 VDC
RF In	Type N, female, 50 $\Omega$
RF In Damage Level	+35 dBm peak, $\pm$ 50 VDC, Maximum Continuous Input ( $\geq$ 10 dB attenuation)
GPS	SMA(f)
External Power	5.5 mm barrel connector, 12.5 to 15 VDC, $\leq$ 4.0 Amps
USB Interface (2)	Type A, Connect USB Flash Drive and Power Sensor
USB Interface	5-pin mini-B, Connect to PC for data transfer
Ethernet Interface	RJ45 connector for Ethernet 10-Base T (Available with opt 411 Ethernet)
Headset Jack	2.5 mm mini-phone plug
External Reference In	BNC, female, 50 $\Omega$ , Maximum Input +10 dBm 1 MHz, 5 MHz, 10 MHz, 13 MHz
External Trigger/Clock Recovery	BNC, female, 50 $\Omega$ , Maximum Input $\pm$ 50 VDC

### Display

Type	Resistive Touchscreen
Size	8.4" daylight viewable color LCD
Resolution	800 x 600

### Battery

Type	Li-Ion
Battery Operation	3.0 hours, typical

### Electromagnetic Compatibility

European Union	CE Mark, EMC Directive 2004/108/EC Low Voltage Directive 2006/95/EC
Australia and New Zealand	C-tick N274
Interference	EN 61326-1
Emissions	EN 55011
Immunity	EN 61000-4-2/-4-3/-4-4/-4-5/-4-6/-4-11

### Safety

Safety Class	EN 61010-1 Class 1
Product Safety	IEC 60950-1 when used with Company supplied Power Supply

### Environmental

Operating Temperature	-10 $^{\circ}$ C to 55 $^{\circ}$ C
Maximum Humidity	95% RH (non-condensing) at 40 $^{\circ}$ C
Shock	MIL-PRF-28800F Class 2
Storage	-40 $^{\circ}$ C to 71 $^{\circ}$ C
Altitude	4600 meters, operating and non-operating

### ESD

RF Port Center Pin	Withstands up to $\pm$ 15 kV
--------------------	------------------------------

### Size and Weight

Size	273 mm x 199 mm x 91 mm (10.7 in x 7.8 in x 3.6 in)
Weight	3.45 kg, (7.6 lbs)

# Spectrum Master™ MS2712E and MS2713E Specifications

## Line Sweep Tools (for your PC)

<b>Trace Capture</b>		
	Browse to Instrument	View and copy traces from the test equipment to your PC using Windows Explorer
	Open legacy files	Open DAT files captured with Hand Held Software Tools v6.61
	Open Current files	Open VNA or DAT files
	Capture plots to:	The Line Sweep Tools screen, DAT files, Database, or JPEG
<b>Traces</b>		
	Trace Types	Return Loss, VSWR, DTF-RL, DTF-VSWR, Cable Loss, Smith Chart, and PIM
	Trace formats	DAT, VNA, CSV, PNG, BMP, JPG, HTML, Data Base, and PDF
<b>Report Generation</b>		
	Report Generator	Includes GPS location along with measurements
	Report Format	Create reports in HTML or PDF format
	Report setup	Report Title, Company, Prepared for, Location, Date and Time, Filename, Company logo
	Trace Setup	1 trace Portrait Mode, 2 Trace Portrait Mode, 1 Trace Landscape Mode
<b>Trace Validation</b>		
	Presets	7 presets allow "one click" setting of up to 6 markers and one limit line
	Marker Controls	6 regular Markers, Marker Peak, Marker valley, Marker between, and frequency entry
	Delta Markers	6 Delta markers
	Limit Line	Enable and drag or value entry. Also works with presets
	Next Trace Button	Next Trace and Previous trace arrow keys allow quick switching between traces
<b>Tools</b>		
	Cable Editor	Allows creation of custom cable parameters
	Distance to Fault	Converts a Return Loss trace to a Distance to Fault trace
	Measurement Calculator	Converts Real, Imaginary, Magnitude, Phase, RL, VSWR, Rho, and Transmit power
	Signal Standard Editor	Creates new band and channel tables
	Renaming Grid	36 user definable phrases for creation of file names, trace titles, and trace subtitles
<b>Connectivity</b>		
	Connections	Ethernet, USB cable, USB Memory Stick

## Master Software Tools (for your PC)

<b>Mapping (GPS Required)</b>		
	Spectrum Analyzer Mode	MapInfo, MapPoint
	Mobile WiMAX OTA, LTE OTA Options	Google Earth, Google Maps, MapInfo
<b>Folder Spectrogram (Spectrum Monitoring for Interference Analysis and Spectrum Clearing)</b>		
	Folder Spectrogram – 2D View	Creates a composite file of multiple traces Peak Power, Total Power, Peak Frequency, Histogram, Average Power (Max/Min) File Filter (Violations over limit lines or deviations from averages) Playback
	Video Folder Spectrogram – 2D View	Create AVI file to export for management review/reports
	Folder Spectrogram – 3D View	Views (Set Threshold, Markers) - 3D (Rotate X, Y, Z Axis, Level Scale, Signal ID) - Playback (Frequency and/or Time Domain)
<b>List/Parameter Editors</b>		
	Traces	Add, delete, and modify limit lines and markers
	Product Updates	Auto-checks Anritsu website for latest revision firmware
	Firmware Upload	Upload new firmware into the instrument
	Pass/Fail	Create, download, or edit Signal Analysis Pass/Fail Limits
	Languages	Add up to two languages or modify non-English language menus
<b>Script Master™</b>		
	Channel Scanner Mode	Automate scan up to 1200 channels, repeat for sets of 20 channels, repeat all channels
	GSM/GPRS/EDGE or W-CDMA/HSPA+ Mode	Automate Signal Analysis testing requirements with annotated how-to pictures
<b>Connectivity</b>		
	Connections	Connect to PC using USB, Ethernet
	Firmware Updates	Product Update: download latest firmware version



# Spectrum Master™ MS2712E and MS2713E Specifications

## Ordering Information – Options

	MS2712E	MS2713E	Description
	100 kHz to 4 GHz	100 kHz to 6 GHz	Spectrum Analyzer
	<b>Options</b>	<b>Options</b>	
	MS2712E-0021	MS2713E-0021	2-Port Transmission Measurement
	MS2712E-0010	MS2713E-0010	Bias-Tee
	MS2712E-0009	MS2713E-0009	20 MHz Bandwidth Demod
	MS2712E-0031	MS2713E-0031	GPS Receiver (requires Antenna)
	MS2712E-0019	MS2713E-0019	High-Accuracy Power Meter (requires External Power Sensor)
	MS2712E-0029	MS2713E-0029	Power Meter
	MS2712E-0025	MS2713E-0025	Interference Analyzer (Option 0031 recommended)
	MS2712E-0027	MS2713E-0027	Channel Scanner
	MS2712E-0431	MS2713E-0431	Coverage Mapping (requires Option 0031)
	MS2712E-0090	MS2713E-0090	Gated Sweep
	MS2712E-0028	MS2713E-0028	C/W Signal Generator (requires Option 0021) (requires CW Signal Generator Kit, P/N 69793)
	MS2712E-0509	MS2713E-0509	AM/FM/PM Analyzer
	MS2712E-0040	MS2713E-0040	GSM/EDGE RF Measurements*
	MS2712E-0041	MS2713E-0041	GSM/EDGE Demodulation*
	MS2712E-0044	MS2713E-0044	W-CDMA/HSPA+ RF Measurements*
	MS2712E-0065	MS2713E-0065	W-CDMA/HSPA+ Demodulation*
	MS2712E-0035	MS2713E-0035	W-CDMA/HSPA+ OTA Measurements**
	MS2712E-0520	MS2713E-0520	P25 Analyzer Measurements*
	MS2712E-0522	MS2713E-0522	P25 Coverage Measurements*
	MS2712E-0530	MS2713E-0530	NXDN Analyzer Measurements*
	MS2712E-0532	MS2713E-0532	NXDN Coverage Measurements*
	MS2712E-0541	MS2713E-0541	LTE RF Measurements*
	MS2712E-0542	MS2713E-0542	LTE Modulation Quality*
	MS2712E-0546	MS2713E-0546	LTE OTA Measurements*
	MS2712E-0551	MS2713E-0551	TD-LTE RF Measurements*
	MS2712E-0552	MS2713E-0552	TD-LTE Modulation Quality*
	MS2712E-0556	MS2713E-0556	TD-LTE OTA Measurements*
	MS2712E-0060	MS2713E-0060	TD-SCDMA/HSPA+ Measurements*
	MS2712E-0061	MS2713E-0061	TD-SCDMA/HSPA+ Demodulation*
	MS2712E-0038	MS2713E-0038	TD-SCDMA/HSPA+ OTA Measurements*
	MS2712E-0042	MS2713E-0042	CDMA RF Measurements*
	MS2712E-0043	MS2713E-0043	CDMA Demodulation*
	MS2712E-0033	MS2713E-0033	CDMA OTA Measurements**
	MS2712E-0062	MS2713E-0062	EV-DO RF Measurements*
	MS2712E-0063	MS2713E-0063	EV-DO Demodulation*
	MS2712E-0034	MS2713E-0034	EV-DO OTA Measurements**
	MS2712E-0046	MS2713E-0046	Fixed WiMAX RF Measurements*
	MS2712E-0047	MS2713E-0047	Fixed WiMAX Demodulation*
	MS2712E-0066	MS2713E-0066	Mobile WiMAX RF Measurements*
	MS2712E-0067	MS2713E-0067	Mobile WiMAX Demodulation*
	MS2712E-0037	MS2713E-0037	Mobile WiMAX OTA Measurements*
	MS2712E-0030	MS2713E-0030	ISDB-T Digital Video Measurements*
	MS2712E-0032	MS2713E-0032	ISDB-T SFN Measurements*
	MS2712E-0079	MS2713E-0079	ISDB-T BER Measurements (Requires option 0030, cannot be ordered with option 0411)
	MS2712E-0064	MS2713E-0064	DVB-T/H Digital Video Measurements*
	MS2712E-0078	MS2713E-0078	DVB-T/H SFN Measurements*
	MS2712E-0057	MS2713E-0057	DVB-T/H BER Measurements (Requires option 0064, cannot be ordered with option 0411)
	MS2712E-0411	MS2713E-0411	Ethernet Connectivity
	MS2712E-0098	MS2713E-0098	Standard Calibration (ANSI 2540-1-1994)
	MS2712E-0099	MS2713E-0099	Premium Calibration to Z540 plus test data

\*Requires Option 0009, \*\*Requires Option 0009 and Option 0031

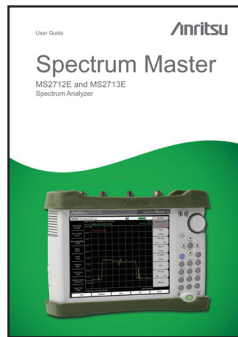
# Spectrum Master™ MS2712E and MS2713E Specifications

**Power Sensors** (For complete ordering information see the respective datasheets of each sensor)



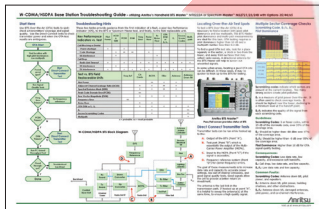
Model Number	Description
PSN50	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +20 dBm
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24104A	Inline High Power Sensor, 600 MHz to 4 GHz, +51.76 dBm
MA24105A	Inline High Power Sensor, 350 MHz to 4 GHz, +3 dBm to +51.76 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm

**Manuals** (soft copy included on Handheld Instruments Documentation Disc and at [www.anritsu.com](http://www.anritsu.com))



Part Number	Description
10920-00060	Handheld Instruments Documentation Disc
10580-00251	Spectrum Master User Guide (Hard copy included)
10580-00242	2-Port Transmission Measurement
10580-00244	Spectrum Analyzer Measurement Guide - Interference Analyzer, Channel Scanner, Gated Sweep, CW Signal Generator, AM/FM/PM Analyzer, Interference Mapping, Coverage Mapping
10580-00234	3GPP Signal Analyzer Measurement Guide - GSM/EDGE, W-CDMA/HSDPA, TD-SCDMA/HSDPA, LTE
10580-00235	3GPP2 Signal Analyzer Measurement Guide - CDMA, EV-DO
10580-00236	WiMAX Signal Analyzer Measurement Guide - Fixed WiMAX, Mobile WiMAX
10580-00237	Digital TV Measurement Guide - DVB-T/H, ISDB-T
10580-00243	P25 and NXDN Measurement Guide
10580-00240	Power Meter Measurement Guide - High Accuracy Power Meter
10580-00256	Programming Manual
10580-00280	PIM Master User Guide

**Troubleshooting Guides** (soft copy at [www.anritsu.com](http://www.anritsu.com))



Part Number	Description
11410-00551	Spectrum Analyzers
11410-00472	Interference
11410-00466	GSM/GPRS/EDGE Base Stations
11410-00566	LTE eNode Testing
11410-00463	W-CDMA/HSDPA Base Stations
11410-00465	TD-SCDMA/HSDPA Base Stations
11410-00467	cdmaOne/CDMA2000 1X Base Stations
11410-00468	CDMA2000 1xEV-DO Base Stations
11410-00470	Fixed WiMAX Base Stations
11410-00469	Mobile WiMAX Base Stations

**Standard Accessories** (included with instrument)

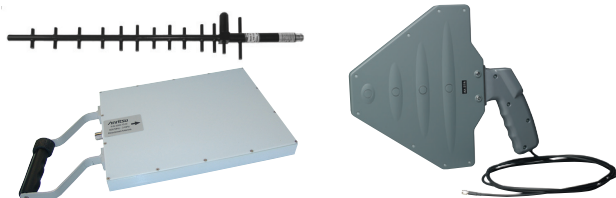


Part Number	Description
10920-00060	Handheld Instruments Documentation Disc
10580-00251	Spectrum Master User Guide (includes Bias-Tee, GPS Receiver)
2000-1654-R	Soft Carrying Case
2300-498	Master Software Tools (MST) CD Disc
2300-530	Anritsu Tool Box with Line Sweep Tools (LST) DVD Disc (For PIM Analyzer Trace Management)
633-44	Rechargeable Li-Ion Battery
40-168-R	AC-DC Adapter
806-141-R	Automotive Cigarette Lighter Adapter
3-2000-1498	USB A/5-pin mini-B Cable, 10 feet/305 cm
11410-00511	Spectrum Master MS2712E, MS2713E Technical Data Sheet One Year Warranty (Including battery, firmware, and software) Certificate of Calibration and Conformance

# Spectrum Master™ MS2712E and MS2713E Specifications

## Optional Accessories

### Directional Antennas



Part Number	Description
2000-1411-R	822 MHz to 900 MHz, N(f), 10 dBd, Yagi
2000-1412-R	885 MHz to 975 MHz, N(f), 10 dBd, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N(f), 10 dBd, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N(f), 9.3 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N(f), 10 dBd, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N(f), 10 dBd, Yagi
2000-1519-R	500 MHz to 3 GHz, log periodic
2000-1677-R	300 MHz to 3 GHz, SMA(m), log periodic
2000-1659-R	698 MHz to 787 MHz, N(f), 8 dBd, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N(f), 12 dBd, Yagi

### Portable Antennas



Part Number	Description
2000-1200-R	806 MHz to 866 MHz, SMA(m), 50 $\Omega$
2000-1473-R	870 MHz to 960 MHz, SMA(m), 50 $\Omega$
2000-1035-R	896 MHz to 941 MHz, SMA(m), 50 $\Omega$ (1/2 wave)
2000-1030-R	1710 MHz to 1880 MHz, SMA(m), 50 $\Omega$ (1/2 wave)
2000-1474-R	1710 MHz to 1880 MHz with knuckle elbow (1/2 wave)
2000-1031-R	1850 MHz to 1990 MHz, SMA(m), 50 $\Omega$ (1/2 wave)
2000-1475-R	1920 MHz to 1980 MHz and 2110 MHz to 2170 MHz, SMA(m), 50 $\Omega$
2000-1032-R	2400 MHz to 2500 MHz, SMA(m), 50 $\Omega$ (1/2 wave)
2000-1361-R	2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA(m), 50 $\Omega$
2000-1659-R	698 MHz to 787 MHz, N(f), 8 dBd, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N(f), 12 dBd, Yagi
2000-1636-R	Antenna Kit (Consists of: 2000-1030-R, 2000-1031-R, 2000-1032-R, 2000-1200-R, 2000-1035-R, 2000-1361-R, and carrying pouch)

### Mag Mount Broadband Antenna



Part Number	Description
2000-1647-R	Cable 1: 698 MHz to 1200 MHz 2 dBi peak gain, 1700 MHz to 2700 MHz 5 dBi peak gain, N(m), 50 $\Omega$ , 10 ft Cable 2: 3000 MHz to 6000 MHz 5 dBi peak gain, N(m), 50 $\Omega$ , 10 ft Cable 3: GPS 26 dB gain, SMA(m), 50 $\Omega$ , 10 ft
2000-1645-R	694 MHz to 894 MHz 3 dBi peak gain, 1700 MHz to 2700 MHz 3dBi peak gain, N(m), 50 $\Omega$ , 10 ft
2000-1646-R	750 MHz to 1250 MHz 3 dBi peak gain, 1650 MHz to 2000 MHz 5 dBi peak gain, 2100 MHz to 2700 MHz 3 dBi peak gain, N(m), 50 $\Omega$ , 10 ft
2000-1648-R	1700 MHz to 6000 MHz 3 dBi peak gain, N(m), 50 $\Omega$ , 10 ft

### Filters



Part Number	Description
1030-114-R	806 MHz to 869 MHz, N(m) to SMA(f), 50 $\Omega$
1030-109-R	824 MHz to 849 MHz, N(m) to SMA(f), 50 $\Omega$
1030-110-R	880 MHz to 915 MHz, N(m) to SMA(f), 50 $\Omega$
1030-105-R	890 MHz to 915 MHz Band, 0.41 dB loss, N(m) to SMA(f), 50 $\Omega$
1030-111-R	1850 MHz to 1910 MHz, N(m) to SMA(f), 50 $\Omega$
1030-106-R	1710 MHz to 1790 MHz Band, 0.34 dB loss, N(m) to SMA(f), 50 $\Omega$
1030-107-R	1910 MHz to 1990 MHz Band, 0.41 dB loss, N(m) to SMA(f), 50 $\Omega$
1030-112-R	2400 MHz to 2484 MHz, N(m) to SMA(f), 50 $\Omega$
1030-149-R	High Pass, 150 MHz, N(m) to N(f), 50 $\Omega$
1030-150-R	High Pass, 400 MHz, N(m) to N(f), 50 $\Omega$
1030-151-R	High Pass, 700 MHz, N(m) to N(f), 50 $\Omega$
1030-152-R	Low Pass, 200 MHz, N(m) to N(f), 50 $\Omega$
1030-153-R	Low Pass, 550 MHz, N(m) to N(f), 50 $\Omega$
1030-155-R	2500 MHz to 2700 MHz, N(m) to N(f), 50 $\Omega$
1030-178-R	1920 MHz to 1980 MHz, N(m) to N(f), 50 $\Omega$
1030-179-R	777 MHz to 787 MHz, N(m) to N(f), 50 $\Omega$
1030-180-R	2500 MHz to 2570 MHz, N(m) to N(f), 50 $\Omega$
2000-1684-R	791 MHz to 821 MHz, N(m) to N(f), 50 $\Omega$

# Spectrum Master™ MS2712E and MS2713E Specifications

## Optional Accessories (continued)

### Attenuators



Part Number	Description
3-1010-122	20 dB, 5 W, DC to 12.4 GHz, N(m) to N(f)
42N50-20	20 dB, 5 W, DC to 18 GHz, N(m) to N(f)
42N50A-30	30 dB, 50 W, DC to 18 GHz, N(m) to N(f)
3-1010-123	30 dB, 50 W, DC to 8.5 GHz, N(m) to N(f)
1010-127-R	30 dB, 150 W, DC to 3 GHz, N(m) to N(f)
3-1010-124	40 dB, 100 W, DC to 8.5 GHz, N(m) to N(f), Uni-directional
1010-121	40 dB, 100 W, DC to 18 GHz, N(m) to N(f), Uni-directional
1010-128-R	40 dB, 150 W, DC to 3 GHz, N(m) to N(f)

### Phase-Stable Test Port Cables, Armored w/ Reinforced Grip (recommended for cable & antenna line sweep applications)



Part Number	Description
15RNFN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to N(f), 50 $\Omega$
15RDFN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 $\Omega$
15RDN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 $\Omega$
15RNFN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to N(f), 50 $\Omega$
15RDFN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 $\Omega$
15RDN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 $\Omega$

### Phase-Stable Test Port Cables, Armored (recommended for use with tightly spaced connectors and other general purpose applications)



Part Number	Description
15NNF50-1.5C	1.5 m, DC to 6 GHz, N(m) to N(f), 50 $\Omega$
15NN50-1.5C	1.5 m, DC to 6 GHz, N(m) to N(m), 50 $\Omega$
15NDF50-1.5C	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 $\Omega$
15ND50-1.5C	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 $\Omega$
15NNF50-3.0C	3.0 m, DC to 6 GHz, N(m) to N(f), 50 $\Omega$
15NN50-3.0C	3.0 m, DC to 6 GHz, N(m) to N(m), 50 $\Omega$
15NNF50-5.0C	5.0 m, DC to 6 GHz, N(m) to N(f), 50 $\Omega$
15NN50-5.0C	5.0 m, DC to 6 GHz, N(m) to N(m), 50 $\Omega$

### Adapters



Part Number	Description
1091-26-R	SMA(m) to N(m), DC to 18 GHz, 50 $\Omega$
1091-27-R	SMA(f) to N(m), DC to 18 GHz, 50 $\Omega$
1091-80-R	SMA(m) to N(f), DC to 18 GHz, 50 $\Omega$
1091-81-R	SMA(f) to N(f), DC to 18 GHz, 50 $\Omega$
1091-172-R	BNC(f) to N(m), DC to 1.3 GHz, 50 $\Omega$
510-102-R	N(m) to N(m), DC to 11 GHz, 50 $\Omega$ , 90 degrees right angle

# Spectrum Master™ MS2712E and MS2713E Specifications

## Optional Accessories (continued)

### Precision Adapters



Part Number	Description
34NN50A	Precision Adapter, N(m) to N(m), DC to 18 GHz, 50 Ω
34NFN50	Precision Adapter, N(f) to N(f), DC to 18 GHz, 50 Ω

### Backpack and Transit Case



Part Number	Description
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle

### Miscellaneous Accessories



Part Number	Description
2000-1528-R	GPS Antenna, SMA(m) with 15 ft cable
2000-1652-R	GPS Antenna, SMA(m) with 1 ft cable
69793	CW Signal Generator Kit
2000-1374	External Charger for Li-Ion Batteries
2000-1371-R	Ethernet Cable, 7 ft/213 cm
3-806-152	Cat 5e Crossover Patch Cable, 7 ft/213 cm)
2300-517	Phase Noise Measurement Software (requires Ethernet Option 0411)
2300-532	Map Master CD
633-75	8000 mAh High-capacity Battery Pack



The Master Users Group is an organization dedicated to providing training, technical support, networking opportunities and links to Master product development teams. As a member you will receive the Insite Quarterly Newsletter with user stories, measurement tips, new product news and more.

Visit us to register today: [www.anritsu.com/MUG](http://www.anritsu.com/MUG)



To receive a quote to purchase a product or order accessories visit our online ordering site: [www.ShopAnritsu.com](http://www.ShopAnritsu.com)

## Training at Anritsu

Anritsu has designed courses to help you stay up to date with technologies important to your job.

For available training courses visit: [www.anritsu.com/training](http://www.anritsu.com/training)



### • United States Anritsu Company

1155 East Collins Boulevard, Suite 100,  
Richardson, TX, 75081 U.S.A.  
Toll Free: 1-800-ANRITSU (267-4878)  
Phone: +1-972-644-1777  
Fax: +1-972-671-1877

### • Canada

#### Anritsu Electronics Ltd.

700 Silver Seven Road, Suite 120,  
Kanata, Ontario K2V 1C3, Canada  
Phone: +1-613-591-2003  
Fax: +1-613-591-1006

### • Brazil

#### Anritsu Eletrônica Ltda.

Praça Amadeu Amaral, 27 - 1 Andar  
01327-010 - Bela Vista - São Paulo - SP - Brazil  
Phone: +55-11-3283-2511  
Fax: +55-11-3288-6940

### • Mexico

#### Anritsu Company, S.A. de C.V.

Av. Ejército Nacional No. 579 Piso 9, Col. Granada  
11520 México, D.F., México  
Phone: +52-55-1101-2370  
Fax: +52-55-5254-3147

### • United Kingdom

#### Anritsu EMEA Ltd.

200 Capability Green, Luton, Bedfordshire LU1 3LU, U.K.  
Phone: +44-1582-433280  
Fax: +44-1582-731303

### • France

#### Anritsu S.A.

12 avenue du Québec, Batiment Iris 1-Silic 612,  
91140 VILLEBON SUR YVETTE, France  
Phone: +33-1-60-92-15-50  
Fax: +33-1-64-46-10-65

### • Germany

#### Anritsu GmbH

Nemetschek Haus, Konrad-Zuse-Platz 1  
81829 München, Germany  
Phone: +49 (0) 89 442308-0  
Fax: +49 (0) 89 442308-55

### • Italy

#### Anritsu S.r.l.

Via Elio Vittorini 129 00144 Roma Italy  
Phone: +39-06-509-9711  
Fax: +39-06-502-2425

### • Sweden

#### Anritsu AB

Borgarfjordsgatan 13, 164 40 KISTA, Sweden  
Phone: +46-8-534-707-00  
Fax: +46-8-534-707-30

### • Finland

#### Anritsu AB

Teknobulevardi 3-5, FI-01530 Vantaa, Finland  
Phone: +358-20-741-8100  
Fax: +358-20-741-8111

### • Denmark

#### Anritsu A/S (for Service Assurance)

#### Anritsu AB (for Test & Measurement)

Kay Fiskers Plads 9, 2300 Copenhagen S, Denmark  
Phone: +45-7211-2200  
Fax: +45-7211-2210

### • Russia

#### Anritsu EMEA Ltd.

#### Representation Office in Russia

Tverskaya str. 16/2, bld. 1, 7th floor.  
Russia, 125009, Moscow  
Phone: +7-495-363-1694  
Fax: +7-495-935-8962

### • United Arab Emirates

#### Anritsu EMEA Ltd.

#### Dubai Liaison Office

P O Box 500413 - Dubai Internet City  
Al Thuraya Building, Tower 1, Suite 701, 7th Floor  
Dubai, United Arab Emirates  
Phone: +971-4-3670352  
Fax: +971-4-3688460

### • Singapore

#### Anritsu Pte. Ltd.

60 Alexandra Terrace, #02-08, The Comtech (Lobby A)  
Singapore 118502  
Phone: +65-6282-2400  
Fax: +65-6282-2533

### • India

#### Anritsu Pte. Ltd.

#### India Branch Office

3rd Floor, Shri Lakshminarayan Niwas, #2726, 80 ft Road,  
HAL 3rd Stage, Bangalore - 560 075, India  
Phone: +91-80-4058-1300  
Fax: +91-80-4058-1301

### • P. R. China (Shanghai)

#### Anritsu (China) Co., Ltd.

Room 1715, Tower A CITY CENTER of Shanghai,  
No. 100 Zunyi Road, Chang Ning District,  
Shanghai 200051, P.R. China  
Phone: +86-21-6237-0898  
Fax: +86-21-6237-0899

### • P. R. China (Hong Kong)

#### Anritsu Company Ltd.

Units 4 & 5, 28th Floor, Greenfield Tower, Concordia Plaza,  
No. 1 Science Museum Road, Tsim Sha Tsui East,  
Kowloon, Hong Kong, P. R. China  
Phone: +852-2301-4980  
Fax: +852-2301-3545

### • Japan

#### Anritsu Corporation

8-5, Tamura-cho, Atsugi-shi,  
Kanagawa, 243-0016 Japan  
Phone: +81-46-296-1221  
Fax: +81-46-296-1238

### • Korea

#### Anritsu Corporation, Ltd.

502, 5FL H-Square N B/D, 681,  
Sampyeong-dong, Bundang-gu, Seongnam-si,  
Gyeonggi-do, 463-400 Korea  
Phone: +82-31-696-7750  
Fax: +82-31-696-7751

### • Australia

#### Anritsu Pty Ltd.

Unit 21/270 Ferntree Gully Road,  
Notting Hill, Victoria 3168, Australia  
Phone: +61-3-9558-8177  
Fax: +61-3-9558-8255

### • Taiwan

#### Anritsu Company Inc.

7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan  
Phone: +886-2-8751-1816  
Fax: +886-2-8751-1817